

Subject Code: R13210/R13

Set No - 1

I B.Tech II Semester Supplementary Examinations Dec./Jan. – 2015/2016

ENGINEERING MECHANICS

(Common to ECE, EEE, EIE, Bio-Tech, E Com E, Agri E)

Time: 3 hours

Max. Marks: 70

Question Paper Consists of **Part-A** and **Part-B**
 Answering the question in **Part-A** is Compulsory,
 Three Questions should be answered from **Part-B**

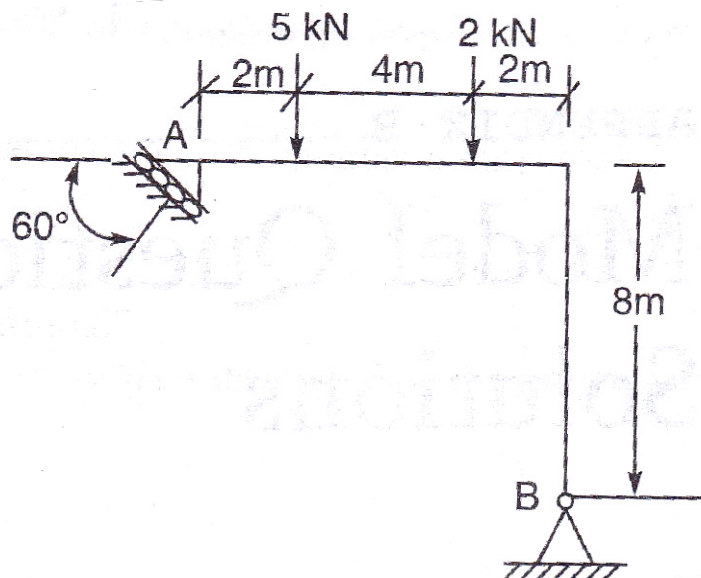
PART-A

1. (a) Find the unit vector of the force $F = 4i - 5j + 8k$.
- (b) What is the principle of transmissibility?
- (c) Use Pappus theorem to find the volume of a sphere of radius r .
- (d) State the Parallel axis theorem.
- (e) State the condition for the dynamic equilibrium of a body under translation.
- (f) What is instantaneous centre of rotation in plane motion?

[4+3+4+4+3+4]

PART-B

2. (a) A block weighing 1000 N is kept on a rough plane inclined at 40° to the horizontal. The coefficient of friction between the block and the plane is 0.4. Determine the smallest (least) force inclined at 15° to the plane required just to move the block up the plane.
- (b) A frame is loaded as shown in Fig. 1. Find the support reactions.



[8+8]

Fig.1

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3. (a) Forces 32 kN, 24 kN, 24 kN, and 120 kN, are concurrent at the origin and are respectively directed through the points whose coordinates are A (2,1,6), B(4,-2,5), C(-3,-2,1), and D(5,1,-2). Determine the resultant.
- (b) State and prove Varignon's theorem.

[8+8]

4. (a) Calculate the moment of inertia of the section shown in Fig. 2 about its centroidal xx and yy axis.

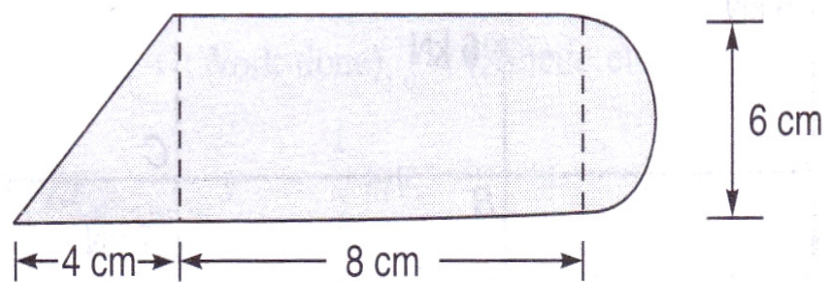


Fig.2

- (b) State and prove perpendicular axis theorem.

[8+8]

5. (a) Find the mass moment of inertia of a thin circular disc (I_{xx} , I_{yy} , and I_{zz}).
- (b) Locate the centroid for the area shown in Fig.3.

[10+6]

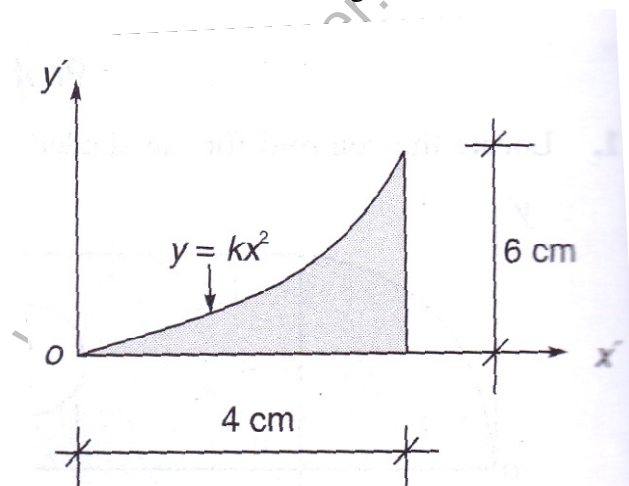


Fig.3

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6. (a) Two cars A and B are travelling in adjacent highway lanes. At an instant of time, their positions and speeds are as shown in Fig.4. If car A has constant acceleration of 0.8 m/s^2 and car B has a constant deceleration of 0.5 m/s^2 , determine
- When and where car A will overtake car B and
 - The speed of each car at that time.

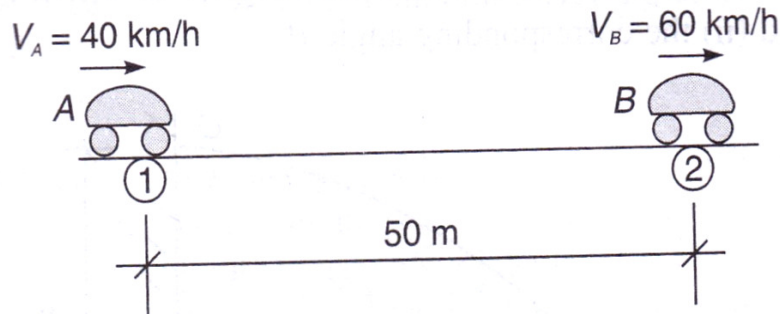


Fig.4

- What is the angle turned by a wheel while it starts from rest and accelerates at a constant rate of 3 rad/s^2 for an interval of 20 sec. ?
- [12+4]
- Define impulse-momentum principle.
 - Define work energy equation.
- [8+8]
